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Separation performance of BioRenewable deep eutectic solvents

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Abstract

© 2015 American Chemical Society. Deep eutectic solvents (DESs) have been regarded as promising cost-effective and environmentally benign alternatives to conventional volatile organic solvents. The screening and selection of the suitable solvent for separation is an important part of the process design. Limiting activity coefficients provide a useful tool for the optimal choice of the selective solvent. For the first time, activity coefficients at infinite dilution have been measured in DESs as a solvent for 23 solutes (aliphatic and aromatic hydrocarbons, alcohols, ketones, ethers, and esters). The DESs were constituted from choline chloride and glycerol in molar ratios of 1:1 and 1:2. The measurements were carried out with the help of gas-liquid chromatography in the temperature range 298-358 K. Using experimental results, selectivity of different separation cases was assessed. To verify the separation performance of DESs the perturbed-chain statistical associating fluid theory (PC-SAFT) was employed for the first time. This method appears to be powerful tool for screening of suitable precursors and evaluation of separation performance at temperatures relevant for practical applications. It has turned out that the separation performances of DESs are comparable to those of ionic liquids, but DESs are cheaper, because they are constituted from natural and renewable nontoxic bioresources.

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